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In re International Applicants: Barry W. TOWNSEND and Byron K. CLAUDINO

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Title: PROSTHETIC FOOT WITH TUNABLE PERFORMANCE

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STATEMENT UNDER ARTICLE 19(I) AND AMENDMENT OF CLAIMS
(PCT Rule 46)

Responsive to the Written Opinion of the International Searching Authority mailed December 16, 2005 in the above-identified International Application, application claims 1-3, 17 and 25 have been amended. Replacement sheets containing the amended claims are enclosed herewith.

The changes in claim 1 involve describing each of the foot, ankle and shank of the prosthesis as "resilient" and changing the method step of "expanding at least one sagittal plane concavity" to --expanding at least two sagittal plane concavities--.

In claim 2, the "foot" is now described as "resilient".

In claim 3, the "shank" is now the "resilient shank".

In claim 17, the "foot" is now described as "extending in a longitudinal direction"; the ankle is now described as "resilient"; and the following clause has been added:

--wherein the ankle and shank are formed as a resilient member, the shank extending upward in a substantially curvilinear manner above the ankle and flexing in the longitudinal direction during gait for storing and releasing energy to improve dynamic response of the prosthesis in gait;--.

Claim 25 has been amended to avoid restating the resilient member limitation added to claim 17.

In summary:

(1) Claims 1-3, 17 and 25 are amended;

(2) Claims 4-16, 18-24, 26-30 are unchanged.

The amendments to the claims patentably distinguish the claimed invention over U.S. Patent Application Publications No. US 2002/0087216 A1 to Atkinson which merely discloses a prosthetic walking system having an ankle with an interconnecting portion which is selectively weakened or flexible between relatively stiff/rigid generally horizontally extending legs of the ankle for flexing within the interconnecting portion, 32/132/232/332/432/532/732, about an axis, 34/134/234/334/434/534/734, that lies in the medial/lateral plane. The limit belt assembly 785 with resilient belt 786 and the limit stage assembly 485 with resilient cord 486 limit the flexing of the upper and lower legs of the ankle away from one another past a low load (e.g. parallel) position as explained with respect to strap 36 and Figs. 5A-6C at col. 7, paragraph [0068]. Atkinson has no substantially curvilinear, resilient shank which flexes in the longitudinal direction that, together with an artificial muscle, aids propulsion of the person's trailing limb and body, and Atkinson does not expand at least two sagittal plane concavities to store energy, as in applicants' claimed invention.

Respectfully submitted,

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Enclosures: Replacement sheets, pages 40, 42 and 43
containing amended claims 1-3, 17, 25

CLAIMS

1. (amended) A method of generating kinetic power for propulsive force in a resilient lower extremity prosthesis including a resilient foot, a resilient ankle and an elongated, upstanding, resilient shank above the ankle, the method comprising:

expanding at least two sagittal plane concavities of the resilient prosthesis during force loading of the prosthesis in the active propulsion phase of a person's gait to store energy in the prosthesis;

releasing said stored energy in the later stages of stance-phase of gait to add to the propulsion of the trailing limb and person's body;

wherein during said force loading of the prosthesis in the active propulsion phase of gait storing additional energy in an artificial muscle provided on at least one of the foot, ankle and shank of the prosthesis and in said later stages of stance-phase in gait, releasing said additional energy to further add to the propulsion of the person's trailing limb and body.

2. (amended) The method according to claim 1, wherein said expanding includes expanding a concavity formed by an upwardly arched midfoot of said resilient foot.

3. (amended) The method according to claim 1, wherein said expanding includes expanding a posterior facing concavity of said resilient shank.

4. The method according to claim 1, wherein a monolithically formed resilient member of said prosthesis forms said ankle and said shank, and wherein said expanding includes expanding a concavity formed by an anterior facing convexly curved portion of said resilient member.

5. The method according to claim 1, wherein said storing additional energy in an artificial muscle includes tensioning a visoelastic material provided on at least one of the foot, ankle and shank of the prosthesis.

14. The method according to claim 1, including forming said artificial muscle using a viscoelastic material selected from the group consisting of rubber and polymer.

15. The method according to claim 1, further comprising during said force loading of the prosthesis detecting a force exerted by the prosthesis and adjusting the energy storage capacity of said artificial muscle during said force loading as a function of the detected force.

16. The method according to claim 1, including preloading the artificial muscle in tension prior to said force loading in gait to increase the potential energy of the prosthesis.

17. (amended) A resilient lower extremity prosthesis comprising:

a foot extending in a longitudinal direction;

a resilient ankle;

an elongated, upstanding, resilient shank above the ankle;

wherein the ankle and shank are formed as a resilient member, the shank extending upward in a substantially curvilinear manner above the ankle and flexing in the longitudinal direction during gait for storing and releasing energy to improve dynamic response of the prosthesis in gait;

an artificial muscle provided on at least one of the foot, ankle and shank of the prosthesis for storing energy during force loading of the prosthesis in the active propulsion phase of a person's gait and in the later stages of stance-phase of gait releasing said energy to aid propulsion of the person's trailing limb and body.

18. The prosthesis according to claim 17, wherein said artificial muscle is preloaded in tension to increase the potential energy of the prosthesis.

19. The prosthesis according to claim 17, further comprising means for adjusting the energy storage capacity of the prosthesis by adjustably preloading the artificial muscle in tension.

20. The prosthesis according to claim 19, wherein said means for adjusting is selected from the group consisting of a cam, a pad and a bladder containing pressurized fluid.

21. The prosthesis according to claim 17, including an artificial muscle on the foot of the prosthesis.

22. The prosthesis according to claim 21, wherein the foot includes a foot keel and said artificial muscle on the foot connects plantar posterior and anterior portions of the foot keel.

23. The prosthesis according to claim 21, wherein the foot includes a foot shell over the lower extremity of the prosthesis and said artificial muscle on the foot connects plantar posterior and anterior portions of the foot shell.

24. The prosthesis according to claim 17, wherein said artificial muscle extends between and connects the prosthesis and a socket on a leg stump of a person's body when the prosthesis is in use.

25. (amended) The prosthesis according to claim 17, wherein said resilient member is a monolithically formed member which at least in the area of the ankle is anterior facing convexly curved.

26. The prosthesis according to claim 25, wherein said artificial muscle is provided on said resilient member.

27. The prosthesis according to claim 26, wherein an artificial muscle is also provided on said foot.

28. The prosthesis according to claim 17, wherein said artificial muscle is formed at least in part of a vascoelastic material selected from the group consisting of rubber and polymer.

29. The prosthesis according to claim 17, further comprising a detector for detecting a force exerted by the prosthesis during said force loading of the